CHAPTER IX: TRIBUTARY STREAM PROJECTS, 1835-1900

The pioneers took care to locate settlements on or near a navigable stream, and they considered any stream which would float a boat at high water navigable, though in dry seasons it might have scarcely enough water to float a toothpick. The virgin lands were fertile, the settlers productive, and surplus agricultural produce was transported on many Ohio Valley waterways before the end of the eighteenth century. One of the earliest aids to waterborne commerce was the enactment of state legislation to resolve the first water users conflict, between the pioneer navigators and the mill-owners who sought to develop water power. Many, if not most, of the streams of Kentucky and Indiana in the Louisville Engineer District were declared legally navigable to prevent their obstruction by mill dams.[1]

After the advent of the steamboat, public support developed for improving navigation on several streams tributary to the Lower Ohio, and, with the aid of Army Engineers loaned by the United States to perform surveys, a few Ohio River tributaries were improved for navigation by state governments and state-chartered private corporations. Congress seldom authorized federal projects for the improvement of streams tributary to the Ohio prior to 1865, but the deterioration of navigation on state projects and unimproved waterways, plus increased public and political support for federal civil works, brought appropriations for tributary streams in the postwar years. And small indeed was the stream which was not improved, or at least surveyed, with federal funds in the last decades of the nineteenth century. So many projects were authorized and partially funded on dimunitive streams by Congress during this era that the rivers and harbors bills earned the apparently well-deserved sobriquet "pork barrel."

General Godfrey Weitzel, Louisville District Engineer, summarized the problem faced by Congress in 1878:

> Our country is so large that if Congress were to appropriate annually all that is asked for by the officer in charge of the public improvements of the country, the amount of the bill would be so large that it would raise a storm of indignation all over the country.
>
> If, to avoid this, an attempt should be made to classify the works according the their importance and thus complete them in their order in a prompt and economical manner, carrying the annual expenditures for this purpose at a sum which would not be objected to by the body of tax-payers, such an attempt would be a total failure in Congress. For it would be impossible to convince the people of one section that there was any public work in any other more important than that in their own.
>
> So Congress must do the best under the circumstances, and try to give every section its just share. The result is that all of our large public improvements are carried on more slowly and at greater expence than public works in other countries, or large works in this country conducted by corporations or companies.[2]

In addition to the Falls of the Ohio project, General Weitzel was assigned responsibility in 1867 and 1870 for surveys and projects on the Tennessee, Wabash, and Cumberland rivers. The Cumberland-Tennessee rivers projects were transferred to the Chattanooga-Nashville Engineer District in 1871, but the Wabash remained the responsibility of the Louisville District. Work on other tributaries of the Lower Ohio were at first the responsibility of the Cincinnati Engineer district, but they also eventually became part of the mission of the Louisville District; and tributary projects constituted a major part of the District program in the late nineteenth century. The three largest

tributary streams in the Louisville Engineer District are the Wabash, Green, and Kentucky rivers, and projects for the improvement of navigation on those streams are an integral part of the history of the District.

Early Navigation Projects on the Wabash, 1822-1860

American Indians and Freanch traders commonly traveled the Wabash as a connecting route between the Great Lakes and the Ohio and Mississippi valleys. Thomas Hutchins and George Washington, among others, recognized the strategic and commercial importance of the Wabash and the heavily-traveled portages between it and the streams which flow into the Great Lakes. During the Revolution George Rogers Clark won control of the Wabash Valley for the United States from a British army from Detroit which crossed the portage and descended the Wabash to Vincennes.[3]

From the earliest days of settlement in the Wabash Valley, the pioneers sent their produce to market via the Wabash and its tributaries. In the spring of 1826, 152 flatboats passed Vincennes bound for New Orleans, transporting such commodities as 250,000 bushels of corn, 2500 head of cattle, 3600 venison hams, and other farm produce. During the 1830s and 1840s, over a thousand flatboats annually navigated the Wabash on the way to market and flatboat construction became a specialized industry in the valley. Keelboats, in great numbers, carried in most of the upstream trade until after 1823 when the steamboat *Florence* first reached Terre Haute. In 1825 the first steamboat reached Lafayette; and in 1834 the *Republican* arrived at Logansport, though it had to be towed by oxen to make the voyage. At high water, steamboats navigated such Wabash tributaries as the Vermilion River (up to Danville, Illionis), the east fork of the White River (to Petersburgh, Indiana), and in 1831 the *General Hanna* steamed up the White River to Indianapolis.[4]

Waterborne commerce on the Wabash thrived, in the absence of other convenient transportation facilities, and citizens became interested in projects to improve navigation at an early date. In 1822, Indiana and Illinois appointed William Polke and Thomas S. Hinde to survey the Wabash and plan its improvement. They recommended clearing a channel through shoals "at least 21 feet wide and three feet deep for the passage of New Orleans keel boats; and 30 feet wide to admit Steamboats through" and construction of a canal around Grand Rapids, or the "Falls of the Wabash," a few miles below Vincennes. But their recommendations were not implemented.[5]

Congress authorized a survey of the Wabash in 1828, which was completed by Captain John L. Smith, Corps of Engineers, and his assistant John K. Graham in 1829. They examined the Wabash from its mouth to Logansport, Indiana, and Captain Smith recommended the authorization of a slack-water project with a minimum navigable depth of 2½ feet below Vincennes and 1½ feet above. The project involved the construction of low timber-crib, stone-filled dams below shoals, with movable "sluice" gates, instead of locks, in each dam for the passage of traffic. Initial costs were estimated at $65,094.29.[6]

The Indiana legislature resolved in 1833 that the Wabash and White rivers were "reserved national streams," serving as outlets to market for a large population, and as such deserved the aid of the United States. Congress enacted a bill in 1834 which would have provided $20,000 to

commence construction of the slackwater project recommended by Captain Smith, but President Andrew Jackson vetoed it on the grounds that it was "extravagant" and the Wabash River lacked a port of entry.[7] This veto had far-reaching consequences for navigation on the Wabash. The financial resources of Indiana were tied up in disastrous canal projects and the state never adopted effective measures for improving navigation on the Wabash. Because of the dangers and delays attending navigation of the unimproved river, commerce switched to roads and railroads as soon as they were available. By the time federal projects on the Wabash commenced it was too late to revive waterways traffic on the Wabash to any appreciable extent.

The only pre-Civil War improvement of navigation on the Wabash of value was completed by a private company, the Wabash Navigation Company, chartered by Indiana in 1844. The company was authorized to improve the river and charge tolls for its use; no general improvements were undertaken however, but the company did complete a lock and dam at the worst obstruction, the Grand Rapids shoals. David Burr and Sylvanus Lothrop, civil engineers, designed and supervised construction of the lock and dam, which consisted of a 210- by 52-foot lock and a 1,030-foot long, 57-foot wide, 10-foot high dam. The gradient of the Falls at Grand Rapids was about ten feet in a distance of 700 feet, and the lock had a lift of about twelve feet. The timber-crib structure was completed in 1849, at initial costs of $70,000, and in its first five months of operation locked through 245 steamboats.[8]

Federal Projects on the Wabash, 1870-1900

Congress ordered a survey of the Wabash in 1870, and General Godfrey Weitzel appointed Frederick Stein, assistant engineer, as chief of survey. Stein examined the Wabash from its conjunction with the Salamonie River to its mouth. He noted that, because of obstructions in the river and the disintegration of the lock and dam at Grand Rapids, commerce on the river was diminishing, and recommended reconstruction of the Grand Rapids project, snag-clearance and dredging, and various other improvements on the Wabash up to Lafayette, Indiana, to restore a navigable channel, stimulate the return of pre-Civil War traffic, and permit development of mineral resources. General Weitzel concurred with these general recommendations; and Congress made its first appropriation for the Wabash River in 1872.[9]

Mr. Stein, as superintendent of the project, made some progress in removing accumulated debris and snags and closing secondary channels with dams in the 1870s; however, the work was often interrupted by mishap. In 1872, for example, a smallpox epidemic broke out aboard the Engineer fleet and "the crews ran off"; in 1879 malaria caused the death of several workers and forced suspension of operations; and, because of the alluvial character of the banks of the Lower Wabash, a number of the timber-crib structures built to close channels were breached and washed out.[10]

The improvement of the Wabash was assigned to a special Engineer District established at Indianapolis, under the command of Major Jared A. Smith of the Corps, in 1877. The reason for the establishment of the special District is not clear; however, it is suspected that there was political pressure from Indianapolis interests who wanted a navigation project on the White River to compete with rail-

roads. Major Smith inspected the Wabash and found a substantial commerce in agricultural produce below Grand Rapids but only two steamboats operating above that point. The value of further improvements on the Upper Wabash were, in his opinion, a "matter of conjecture." On the other hand, he also examined navigation on the White River, from Indianapolis to the Wabash, and found it to be "the natural outlet to a wonderfully productive portion of the State."[11]

Congress funded a project to remove snags, blast a navigable channel, and construct spur-dikes on the White River in 1879, and Major Smith directed active work for a few years. The project did stimulate a little traffic; by 1887 three steamboats were plying the White River, transporting chiefly grain and lumber. Major Smith reported that despite the small amount of commerce on the White, the project had more than paid for itself because railroads had reduced rates to the region to meet potential waterways competition. [12] The use of waterways as regulators of railroad rates was a feature common to many late nineteenth-century project rationales, and reductions in regional railroad rates were listed as "Effects of Improvement" in the *Annual Report of the Chief of Engineers* until 1932.

The Indianapolis Engineer District closed in 1885, and the Wabash-White River projects were transferred back to the Louisville District, which terminated the Wabash project above Grand Rapids until the lock and dam, funded in 1885, was completed at Grand Rapids to open the Upper Wabash to through navigation. The Grand Rapids lock and dam project was a monumental case of "too little, too late." When the project, with a stone-masonry lock, lock-gates of white oak, and a timber-crib dam, opened to navigation in 1894, Wabash River commerce was dead. In its first year of operation, Grand Rapids Lock served two steamboats plus assorted houseboats and skiffs. The Assistant Engineer in charge of the project said:

> The cause of this lack of river traffic is not difficult to find. The Wabash improvements were begun by a joint commission of the States of Illinois and Indiana at an early day, before railways were known, or their great carrying power understood, and when river traffic was the sole mode of transportation. But since then a vast network of railways have crossed the entire Wabash Valley between Terre Haute and the mouth of Wabash River. Eight great through lines of railway cross this stream between Terre Haute and its mouth.[13]

At the turn of the century, the Louisville District Engineer reported that if the improvement of the Wabash for navigation were to be continued, "a comprehensive and correct survey of the river is prerequisite to the preparation of an intelligent project and estimate for the systematic improvement of the river." In 1903 the District recommended a six-foot slackwater project for the Lower Wabash up to Vincennes, consisting of eleven locks and dams at costs of three and a half million dollars. Studies of the economic structure and transportation needs of the Wabash Valley then indicated that a thriving waterborne commerce, particularly coal-barging, would utilize the project if constructed. But the Board of Engineers for Rivers and Harbors, in line with reordered priority calling for completion of projects already underway, rejected the proposed slackwater project for the Wabash, stating that no new projects would be undertaken on Ohio River tributaries until the slackwater project on the Ohio was completed. No slackwater project on the Wabash was ever completed, though one was still under con-

The Grand Rapids locks and dam on the Wabash River

sideration in 1975.[14]

Early Navigation Projects on Green River, 1828-1842

The first American pioneers to settle in the Green River Valley used the river and its tributaries to send produce in flatboats to New Orleans, but Evansville, Indiana, on the Ohio just below the mouth of the Green, eventually became the marketing center for Green River commerce. During much of the nineteenth and for several decades in the twentieth century, the Green River Valley supplied Evansville saw mills and wood-working plants with timber; Evansville claimed in 1898 to be the largest hardwood manufacturing center in the world. Logs cut on the Green River or its tributaries in July, were allowed to dry until winter, then pinned together with wooden pegs in rafts and floated down to Evansville.[15]

The steamboat *McLean* was the first to reach Bowling Green in 1828, and it was followed by other boats at each high water. In 1828 also, Kentucky established a Board of Internal Improvements, which requested the loan of United States Army Engineers for surveys of streams in Kentucky. Lieutenant William Turnbull and Lieutenant Campbell Graham, Topographical Engineers, surveyed the Green River in 1828 and turned the results over to the state Board. As part of its state-wide internal improvements program, Kentucky authorized development of a slackwater project to improve navigation up the Green and Barren rivers to Bowling Green in 1833, and employed an experienced civil engineer, General Abner Lacock, former Congressman and Senator of Pennsylvania and engineer on the Pennsylvania canal system, to locate the locks and dams. The Green-Barren River project was the first improvement of its kind in the United States, and canal engineers were the men with the most closely related experience. (As previously mentioned, construction of a slackwater project became known as a "canalization" project; that is, to make like a canal.)[16]

William B. Foster, also a Pennsylvania canal engineer, was first resident engineer in charge of construction, but because of ill-health he resigned in early 1835 and the project was completed under the direction of Alonzo Livermore, another Pennsylvania canal engineer recommended by General Lacock. Construction of Locks and Dams Nos. 1 and 2 was underway when Livermore took over; however, Livermore modified their designs to increase lock chamber dimensions to 160 feet long by 36 feet wide. He selected the sites of two more locks and dams on the Green (Nos. 3 and 4) and one on the Barren (No. 1) to establish 175 miles of six-foot slackwater navigation from the mouth of the Green up to Bowling Green on the Barren. The locks were constructed, under contract, of sandstone masonry laid in Louisville hydraulic cement (except No. 2 which was laid in common lime). To overcome a gradient of 78 feet in 175 miles, the locks averaged fifteen and a half feet of lift. The dams were timber-crib, rock-filled structures, with masonry abutments.[17]

Several contractors failed on the project, and other problems were experienced — chiefly resulting from poor foundation conditions and damages to completed work by floods. A flood in 1840, for example, breached an abutment of Lock and Dam No. 3 and carried away the lower lock-gates. Exclusive of the costs of snag-removal and general channel clearance, initial construction costs aggregated $780,000 — about $10,000 per

foot of lock-lift. This cost was about triple the original cost estimates; however, the first estimates were for smaller locks and lesser-quality materials and did not provide for such contingencies as the costs of repairing flood damages.[18]

Though the project was not entirely completed in 1841, the steamboat *Sandusky* locked through to Bowling Green late in the year, thereby clearly demonstrating, one contemporary observer said, that "the removal of the obstructions to the navigation of all the great rivers of the West is practicable." Over $2,000 in tolls were collected during the first year of operation and fears that the project would form a health hazard and would be a waste of money were dissipated. Residents of the Green Valley readily acknowledged the "advantages derived from a perpetual line of the finest water navigation in the world." Regular steamboat trade between Evansville and Bowling Green was inaugurated; citizens of Bowling Green constructed a six-story warehouse at the river and a mule-powered railroad to connect the landing with the business section; and the project provided a substantial economic boost to the commercial development of the region.[19]

Free Navigation on the Barren and Green, 1865-1890

The navigation structures on the Green and Barren rivers were damaged and their maintenance was neglected during the Civil War, and in 1868, rather than expend the funds necessary to repair the project, the state legislature leased the works to the Green and Barren River Navigation Company, an organization of bankers, attorneys, and steamboatmen led by W. S. Vanmeter, the steamboat captain who had obstructed Lock No. 3 for the Confederacy in 1862. The company operated the project, opened mines and entered other business, and ran its own steamboats, the *Evansville* and *the Bowling Green*. Since company-owned vessels paid no tolls, the company soon drove competition from the river and established a *de facto* monopoly.[20]

Opposition to the monopoly soon developed, and it had very influential leadership in the person of General Don Carlos Buell, former Union General who settled in the Green Valley (at Airdrie, Muhlenburg County) after the war, opened coal mines, and began shipping coal down river to Memphis in late 1865. His business grew until 1868, when the navigation company took over the project and, with its toll-free privileges, undersold him and drove him from the market. General Buell led a campaign to end the company monopoly and free the river of tolls. When his efforts failed in the state legislature, he took the case to Congress, contending:

> If the claim of Green River to the care of the Government as a public avenue rested on nothing but the expressive fact that at one period in our civil war the slackwater navigation served as a valuable channel of supplies for a Union army at a critical moment when all other lines failed, the question might properly be dismissed. But the ordinary trade of the Green River country has been relatively large from the earliest settlement, and the magnitude of its undeveloped resources expecially in minerals, demands for it the facilities of an extended interstate commerce.[21]

General Buell's complaint that the company rested "like an incubus on the destinies of the Green River Valley" brought Congressional action in 1879. An investigation was ordered, and the Corps of Engineers reported that tolls on the Green and Barren rivers were excessive and that a monopoly did exist. Congress

directed the Corps to ascertain the steps necessary for federal purchase and toll-free operation of the project, and a special Board of Engineers convened at Bowling Green in 1886. The Board conferred with directors of the company, inspected the project, reported that an injurious monopoly did exist, and recommended "in justice to the country tributary to the Green and Barren rivers, the present obstructive tax on its commerce should be removed." The Kentucky legislature ceded its rights to the project to the United States in 1886, and Congress purchased the company franchise for $135,000 in 1888.[22]

Lock No. 3, the one most heavily damaged during the war, collapsed in 1887; other locks were in poor condition; the channel was littered with snags; and through navigation on the river had been suspended when the United States took over the project. Lieutenant William L. "Goliath" Sibert, Corps of Engineers, was assigned the duty of reopening the river to navigation. Sibert, a physically large man, had roomed at the Point with diminutive David Gaillard — hence Sibert's nickname "Goliath." His work on the Green and Barren river project was his first civil works experience and it launched him on a distinguished engineering career which took him around the world, but he was to call the Green River Country home ever afterwards. Sibert established an Engineer office at Bowling Green, arranged construction of the snag-boat *William Preston Dix* to clear the Green River of snags, and initiated an emergency reconstruction of Lock No. 3 to reopen the river.[23]

Difficulties were experienced in pumping water out of the cofferdam at Lock No. 3 in 1889, and in 1890 Lieutenant Sibert called in a waterways engineering expert, Benjamin F. Thomas, U. S. Assistant Engineer on the Big Sandy River, who got the cofferdam pumped out in ten days, put in the new masonry, and opened the lock to navigation on November 10, 1890. Residents of the Green Valley were "jubilant" and hundreds gathered at the river to see the first boat pass through toll-free. General Buell reopened his coal mines, the timber-rafting business increased, and, because the boats could transport commodities at about half the prevailing rail rates, railroads reduced rates to meet the competition. Commerce on the river quadrupled — as many as sixteen steamboats soon plied the waterway regularly. The editor of the Calhoon, Kentucky, *Constitution* wrote in 1890:

> It is very observable that since Green river has been made free to all who desire to run any kind of craft upon its waters, commercial affairs are assuming larger proportions; new farms are being opened, and various kinds of manufacturing establishments are springing up along its course.[24]

Rough River Project

The success attending the repair and toll-free operation of the Green River project stimulated support for extending the slackwater system. Of special interest was the project constructed on the Rough River to furnish slackwater from the confluence of the Rough with the Green up to the town of Hartford, Kentucky — it was the first river lock constructed entirely of monolithic concrete in the United States.

A Kentucky state engineer had surveyed the Rough River in 1836 and recommended a slackwater system for the stream to permit development of timber and mineral resources, but it was not done. In 1856 the Rough Creek Navigation and Manufacturing Company was

incorporated; shortly after the Civil War it constructed a crude lock and dam about eight miles from the mouth of the Rough and a regular steamboat traffic developed up to Hartford. The trade ended, however, when the Green River company imposed tolls and the Rough Creek company abandoned its lock and dam.[25]

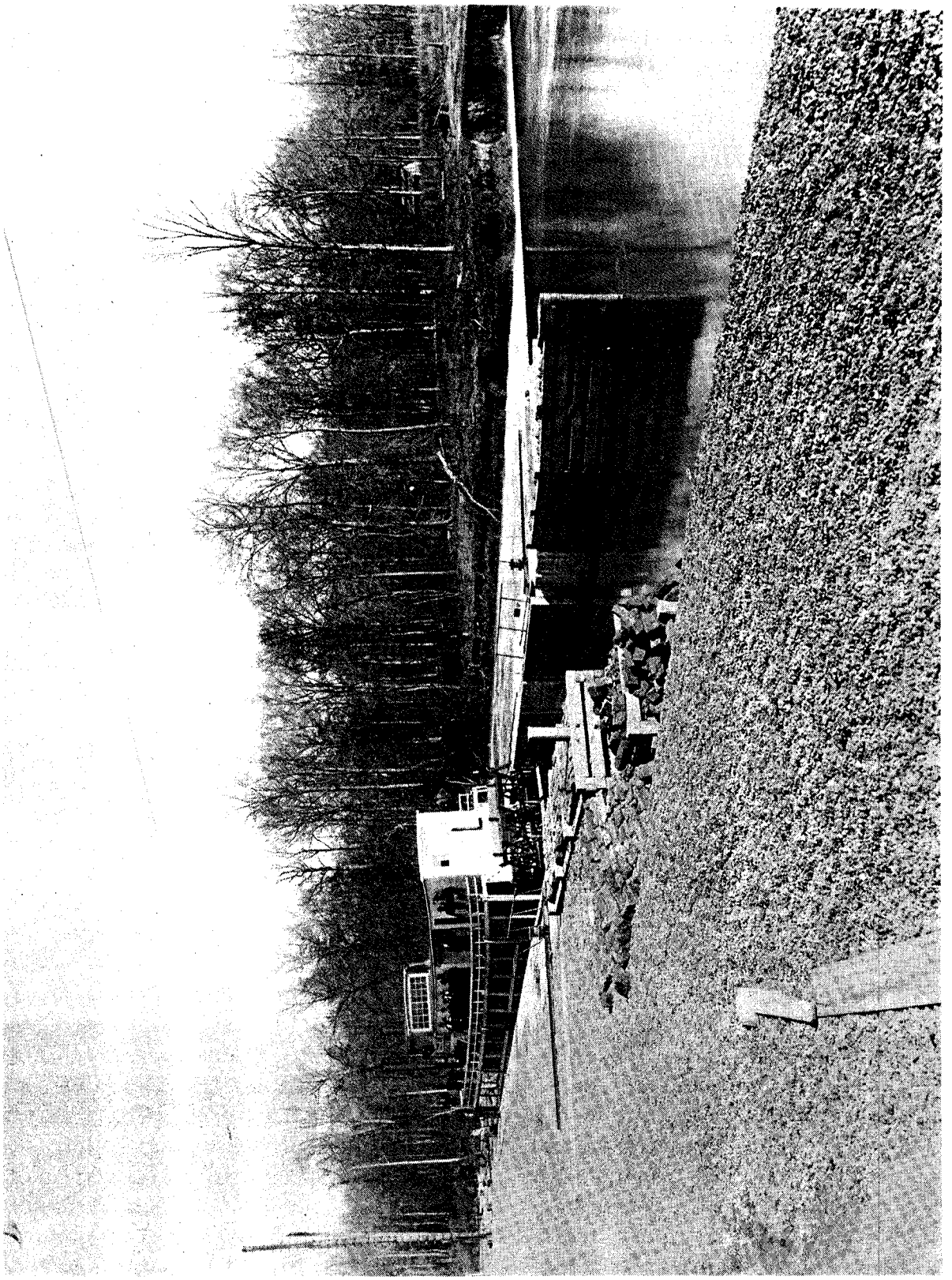
Congress authorized a project to reestablish traffic on the Rough River in 1890. Trees were cleared from the banks, snags removed from the channel, and construction of a new lock and dam, near the site of the old one, commenced, under the direction of Assistant Engineer William M. Hall. Hall later directed the construction of sixteen locks and dams on the Upper Ohio River, and implemented a number of novel waterways engineering methods, such as those for anchoring concrete structures to foundation rock and for drilling cores from substrata to ascertain foundation conditions. Plans for the Rough River lock called for the use of common stone masonry in construction, but bids for furnishing cut-stone were excessive because of limited access to the project site, and Hall recommended the substitution of concrete of "imported Portland cement." The Chief of Engineers approved in 1895, and construction of the concrete lock, with chamber dimensions of 27 feet width, 123 feet length, and 9 feet lift, was completed in 1896, at a cost of $85,000.[26]

In 1899, three steamboats and a number of small vessels were plying the Rough River up to Hartford; they transported 10,883 tons of freight in that year. But 1899 was just about the peak for traffic on the Rough River. The project, exept for its precedent-setting construction method, was a signal failure. No extensive traffic ever developed on the Rough River, though it is possible, because of low construction and operation costs, that during its many years of operation the public investment in the project was adequately reimbursed in the form of lower transportation costs, if reductions in rail rates are included.[27]

Green River Slackwater Extension

When R. H. Fitzhugh, assistant to Colonel William E. Merrill, examined the Green River in 1879, he reported it would be feasible to construct eight locks and dams above Lock and Dam No. 4 (at Woodbury, Kentucky) on the Green River to extend slackwater navigation to such communities as Brownsville, Munfordville, and Greensburg. Fitzhugh explored Mammoth Cave, reported that the water in the cave was at the same level as the river, and concluded that a slackwater project would have no more effect on the famous cave than an ordinary rise in the river.[28]

No action was taken on the Fitzhugh report, but, concurrent with successful reopening of the old state project on the lower river, another examination of the Upper Green was authorized in 1890. Lieutenant William L. Sibert reported the construction of two additional locks and dams (Nos. 5 and 6) on the Green could open mineral and timber resources of such tributaries as Bear Creek and Nolin River to development and establish waterways transportation to the popular resort area at Mammoth Cave. Congress approved construction of Locks and Dams Nos. 5 and 6; William M. Hall moved Engineer equipment from Rough River and commenced construction; and in 1906 the steamboat *Chaperon* made the first run from Evansville to Mammoth Cave. A regular tourist and excursion traffic developed to and from the Cave region and commerce on the Green River



Rough River Lock—View on 16 December 1896, showing upper entrance to the lock with packet boat *City of Hartford* being locked through.

system increased, but the public investment in Locks and Dams Nos. 5 and 6 was probably never reimbursed. Timber and asphalt resources on the Upper Green were developed to a limited extent, but general commerce was also served by the Louisville and Nashville Railroad and the turnpike between Bowling Green and Louisville.[29]

Early Navigation Projects on the Kentucky River

Some of the first settlements in Kentucky, notably Boonesborough founded by Daniel Boone in 1775, were located along the steeply palisaded gorge of the Kentucky River. Use of the Kentucky river for commerce was concurrent with the earliest use of the Ohio for that purpose. General James Wilkinson initiated trade with New Orleans in 1787 with flatboats freighted with Kentucky River Valley produce. In addition to agricultural produce normally exported via Ohio Valley waterways, large quantities of hemp, tobacco, and salt went to market at an early date via the Kentucky River. The first steamboat to navigate the Kentucky River was constructed by Edward West at the mouth of Hickman Creek in 1816, and in 1818 James Johnson and Richard M. Johnson (Vice President of the United States, 1837-1841) built several steamboats on the Kentucky near Frankfort, which joined the *Western Engineer* in the expedition to the Missouri Valley in 1819.

Interest in improving navigation on the Kentucky developed not long after the Commonwealth achieved statehood. In 1801 the Kentucky River Company, authorized to clear the river and charge tolls, was chartered, but it evidently accomplished very little. In 1828 and 1829, Lieutenant William Turnbull and Lieutenant Napoleon B. Buford, Topographical Engineers, surveyed the Kentucky from its mouth at Carrollton to Boonesborough. They recommended to Congress that an experimental wing dam be constructed on the Kentucky River, and, if the experiment were successful, a navigation project be adopted. President Jackson vetoed a bill which would have funded federal work on the Kentucky, however, and the Commonwealth improved the river with its own funds.[31]

The Kentucky was resurveyed in 1835 by state engineer R. Philip Baker, former assistant to Colonel Stephen H. Long, and Lieutenant Buford, the former Topographical Engineer. They recommended a system of seventeen locks and dams on the mainstream to establish a six-foot slackwater depth to the Three Forks at Beattyville, Kentucky. They also suggested slackwater navigation up South Fork of the Kentucky to open navigation to the salt works at Goose Creek and pointed out that a canal could be constructed from the South Fork to the Cumberland River at Pineville, Kentucky. It was even feasible, in their opinion, to build a canal through Cumberland Gap to the Tennessee River watershed and through mountain gaps to the rivers of Georgia leading to the Atlantic; thus, providing the Ohio, Kentucky, Cumberland, and Tennessee valleys with an outlet to the Atlantic, a "Southern Route" competing with the Erie Canal.[32]

The visionary canal route was never seriously considered, but there was support for a project on the mainstream of the Kentucky. The *Frankfort Commonwealth* commented that the opening of the river to navigation would "penetrate into the very heart of the State — develop the resources of an extensive region of the country, which without such an improvement,

must be forever valueless — open up a way to the inexhaustible coal mines near the sources of the Kentucky, and also to the salt works." The Commonwealth authorized construction of a slackwater project on the Kentucky in 1835, and Sylvester Welch, the Pennsylvania engineer who had designed the famous Allgheny Portage Railroad, was selected as project engineer.[33]

Sylvester Welch directed construction of five locks and dams to establish 95 miles of six-foot slackwater from Carrollton to Oregon, Kentucky, a few miles above Frankfort. But construction of Locks Nos. 6 and 7 was suspended in 1842 after funds had been exhausted. At construction costs of about $900,000, five timber-crib dams and masonry locks were completed, the locks with chamber dimensions of 38 feet width, 145 feet length, and an average of 14 feet lock-lift. The Kentucky River project was never a profitable investment for the state — toll collections, after payment of operating costs, paid less than one percent annually on initial costs. But project purposes were amply fulfilled, for available economic navigation stimulated development of the Kentucky Valley and Bluegrass region, whose products and produce moved steadily down the waterway to market at Louisville and down river ports.[34]

As on the Green River project, maintenance of the Kentucky River project was neglected during the Civil War and waterborne commerce dwindled. The state legislature was unwilling to appropriate the funds necessary to repair the navigation structures, and in 1865 turned the project over to the Kentucky River Navigation Company, a public corporation financed by the bonds of counties bordering the river. But a court declared the bonds illegal, the company lease on the project was annulled, and operation of the project ceased in 1873. Napoleon B. Buford, the officer who had conducted the original surveys in 1828 and who had become a Major General of Union volunteers in the Civil War, introduced a bill in the Kentucky legislature in 1878 to raise a million dollars for the revitalization of the project, but it failed and the Kentucky delegation to Congress requested federal aid.[35]

Congress authorized a federal study of the project in 1878, and Colonel William E. Merrill selected R. H. Fitzhugh for the task. Fitzhugh recommended repair of the old state project and extension of slackwater to Beattyville and a considerable distance up the Three Forks. Colonel Merrill limited the recommended project, however, to reconstruction of the five old structures and the building of twelve more to canalize the river to Beattyville. Congress authorized and funded the project in 1879, and Kentucky ceded jurisdiction over the old project to the United States on March 22, 1880.[36]

A separate Engineer District for the Kentucky River and a few other streams tributary to the Ohio was established at Cincinnati. It became known as the Second Cincinnati District to distinguish from the First Cincinnati District which was responsible for general improvement of navigation on the Ohio. The Second Cincinnati District demolished the rotted timber-cribs of the old state project, reconstructed the dams, repaired the locks, removed snags from the channel, and reopened navigation on the Kentucky up to Frankfort in March, 1881. Traffic revived on the river, furnishing transportation for about ten cents per hundredweight, as compared with twenty-three cents by rail. In the first year of operation, coal shippers alone were saved $66,000 in

freight charges. In the opinion of the Second Cincinnati District, reopening navigation on the Kentucky River had immediate and sweeping results; it reported: "The people tributary to the river seem to have been stimulated to new life by these conditions, as is evident by the generally-improved conditions of the farms and farm-houses and the increased acreage under cultivation."[37]

The Beattyville Project

In 1882 Congress, as a result of political pressures from representatives of the Upper Kentucky Valley, provided that $75,000 of the Kentucky River appropriation be applied to the construction of a lock and movable dam at Beattyville.The appropriation was made without survey, without previous study, and without the approval of any office of the Corps of Engineers. Corps plans called for extending the slackwater project on the Kentucky upstream from old Lock and Dam No. 5 as appropriations permitted. But citizens of the upper valley wanted a slackwater pool up the Three Forks from Beattyville to provide a safe harbor for commodities awaiting a navigable water stage on the mainstream of the Kentucky to descend to market. Great losses occurred annually on the Three Forks when log-rafts and flatboats loaded with coal, iron, and salt were destroyed by sudden violent floods and ice jams.[38]

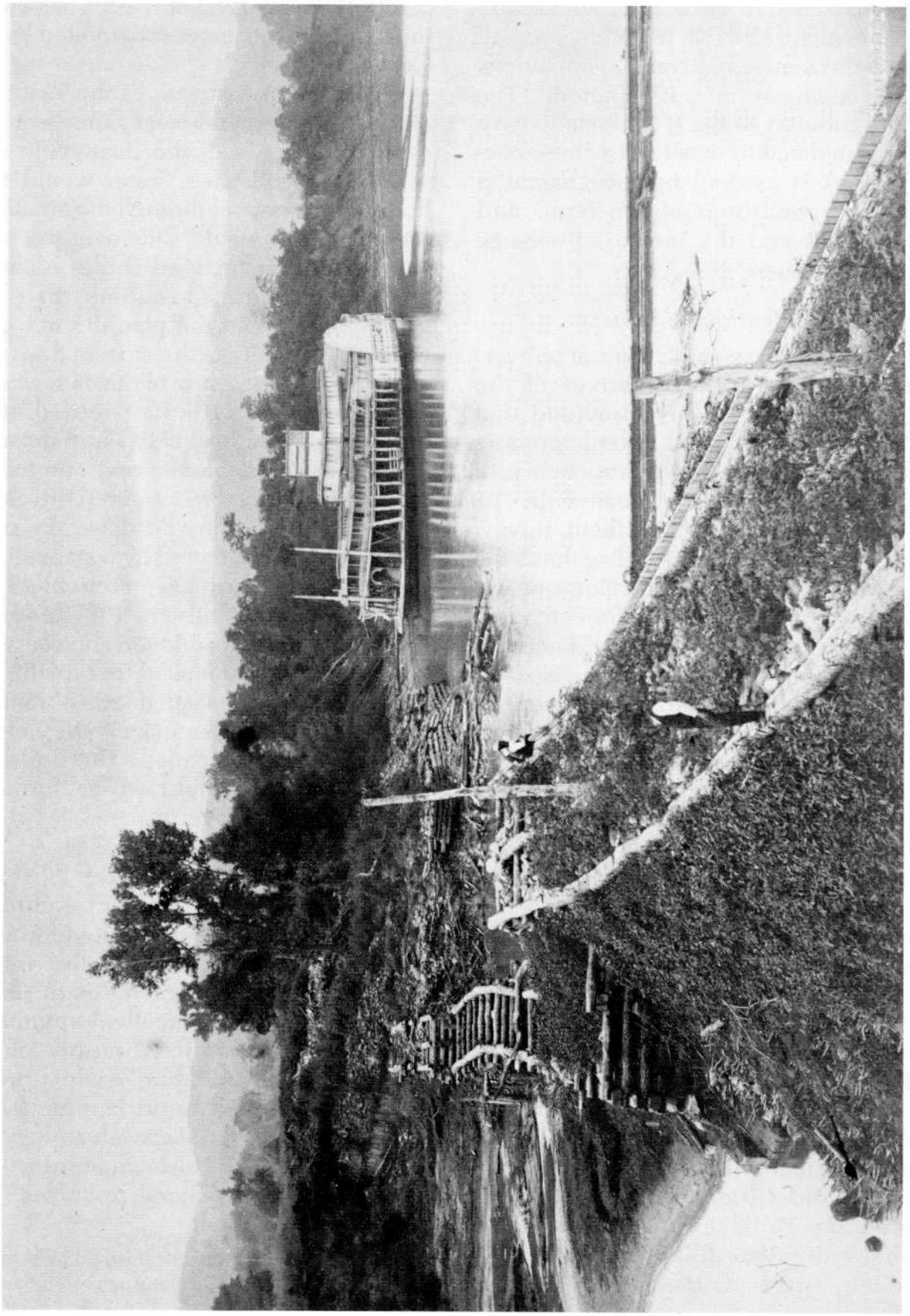
A special Board of Engineers recommended in 1883 that construction of a lock at Beattyville be held in abeyance until an ascending traffic developed to require it and, and, instead, a movable bear-trap gate be installed in the crest of the dam. The Second Cincinnati District completed the project in 1886; it was a timber-crib, stone-filled dam with two wooden, two-leaf, bear-trap gates (or "weirs"), each sixty feet wide. These were the first bear-trap gates constructed by the Corps of Engineers.[39]

When the mainstream of the Kentucky reached a navigable stage, the bear-trap gates in the crest of the Beattyville dam were to be collapsed, water would flow from the upper pool through the openings, boats and rafts would slide over the bear-traps and down inclined chutes between guide walls, and then continue their voyage to market. But the plan did not work well. The velocity of the current down the chute on the lower side of the dam was too great; a number of boats wrecked when descending; and boat crews and raftsmen often became frightened and jumped for their lives as their craft entered the chute, leaving them to run wild down the river. The pressures generated by water velocity also wore and tore away sections of the chute and guide walls. In 1887 the bear-trap scheme was abandoned and construction of a lock commenced, but in 1891 all further work was suspended. A railroad line crossed the Kentucky Valley above Beattyville, and, except for log-rafts, transported all freight which formerly moved down the river.[40]

Extension of Slackwater Project

An independent study of Kentucky economic and industrial development completed in 1887 pointed to the restoration of waterborne commerce on the lower Kentucky river as an excellent example of the broad economic stimulus cheap waterways transportation could provide and recommended rapid completion of the Kentucky River slackwater project to Beattyville, chiefly to facilitate development of coal and mineral resources. The study recommended:

> On the score of economy, it would be better for Congress, instead of making appropriations by



Kentucky River Lock and Dam No. 1—view south shows breach and cribs, 1883

> driblets, to set apart a sum sufficient to place all the remaining locks and dams under contract at once, and complete them in two or three years, instead of making a lock and dam every year or two, extending the time for the completion of the navigation ten or fifteen years, and suffering losses from floods, &c., from the incompleted state arising from lack of adequate appropriations.[41]

But Congress did not accept this latter suggestion, or many other similar recommendations, and the Kentucky River slackwater project was not completed until 1917, after some thirty years of sporadic construction. The original project of 1883 called for the construction of twelve locks and dams in addition to the five old state structures; it was modified by increases in lock-lift to fifteen and eighteen feet to reduce the number of new locks and dams to nine, and the project, as completed in 1917, had fourteen navigation structures. Twenty-four steamboats, fourteen of them passenger packets, were plying the Kentucky, but the transportation of coal was handled almost completely by railroads in 1900. The steamboat trade on the Kentucky began to dwindle after 1900 and by 1917, the year Lock and Dam No. 14 was completed, it had reached a very low ebb, as had waterborne commerce on most other inland rivers, including the Ohio.[42]

Other Tributary Projects, 1865-1900

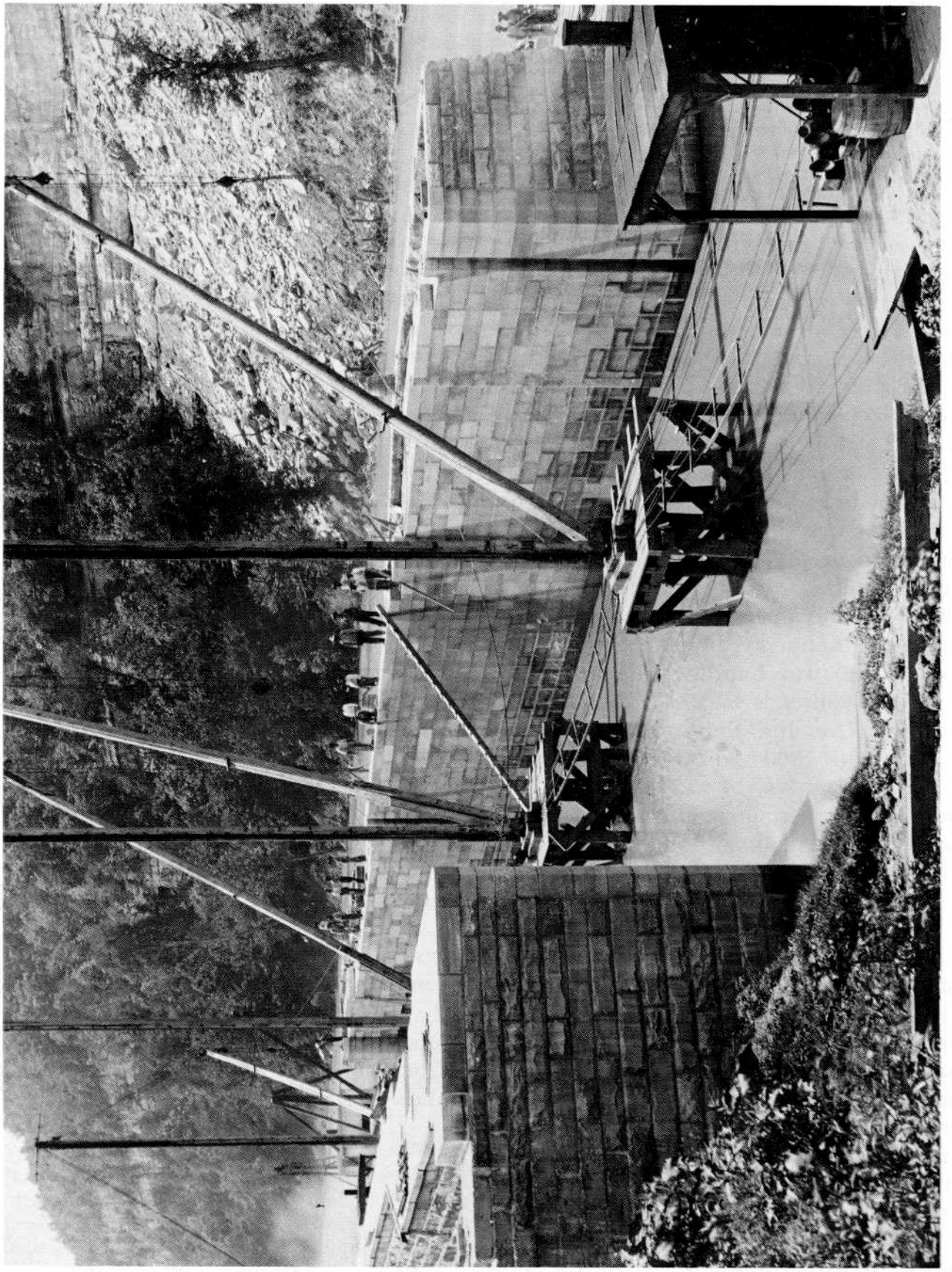
As previously noted, the stream which was not surveyed at the direction of Congress for a navigation project in the late nineteenth century was small indeed. Colonel William E. Merrill was once ordered to survey a stream which he could remember walking across at its mouth during the Battle of Perryville in 1862 without wetting his feet. The Louisville Engineer District was directed to survey scores of rivers for possible navigation projects during the era, and many were on streams which were patently unfit for any kind of commercial navigation. Congress once ordered a survey of a stream which the Chief of Engineers was forced to admit the Corps could not accomplish, because, after diligent search, no such river could be found.[43]

The remarks of General Weitzel about the political problems attending rivers and harbors legislation will be recalled. They were applicable, in general, to every rivers and harbors bill until the twentieth century; in efforts to satisfy constituents, Congress authorized and funded many surveys and projects of questionable value in order to get sufficient support for important and beneficial projects. At times, however, the Corps was able to accomplish more on "pork barrel" projects than might have been expected. The Tradewater River in the Louisville Engineer District provided an excellent example.

The Tradewater River is a narrow, tortuous stream with a drainage basin about sixty miles long and twenty miles wide, which joins the Ohio River just below Caseyville in Western Kentucky. The Rivers and Harbors bill of 1878 included a provision for a survey of the Tradewater, and Congressman Samuel S. Cox of New York, in opposing the bill before the House, said: "There is a provision here for the survey of a river in Kentucky which a friend of mine near me says ought to be macademized. [Laughter] That is the only way to make it a thorough-fare. [Laughter]"[44]

Congressman John Kenna of West Virginia replied:

> When a gentleman comes before the committee and asks for a survey of a river which he states is navigable and of commercial importance, how in the name of God can any committee be protected from imposition, if the facts are not represented except by an official and proper survey?[45]



Kentucky River Lock No. 7—looking upstream, 1897

Rather than provide funds to "macadamize" the Tradewater, Congress authorized the survey. The Corps found that large quantities of agricultural commodities, which might use the river, went to market from the Tradewater Valley via miserable roads, and coal shipments on the river, which totaled 7,692 tons in 1880, could be expected to increase if navigation were improved. Congress appropriated $3,000 for improvement of the Tradewater in 1881 and subsequently made a few other small appropriations. Engineer work parties cleared the Tradewater, removing snags and overhanging trees and blasting rocks from shoals to create a forty-foot wide and three-foot deep channel on the lower forty-one miles of the river. By 1886 five small steamboats were plying the Tradewater, transporting small amounts of general freight and large amounts of high-quality coal. Coal shipment on the Tradewater rose to 30,000 tons in 1889, triple the amount shipped when the project was authorized, and, in short, the limited Tradewater project provided substantial benefits.[46]

But when Congress directed the Tradewater be surveyed for a lock and dam slackwater system in 1896, the Corps reported unfavorably, pointing out that at low-water it would require two or more hours to supply a single lockage and that railroads had entered the Tradewater Valley in the late 1880s and were providing adequate transportation facilities for the area. The Louisville District Engineer concluded the report with a few general observations:

> The Tradewater River is in the same class with many others tributary to the Ohio River, in that an improvement of any character will be followed by an increase in the river trade. Many such rivers have been improved or are now under improvement, and the results of these improvements, even on streams which are larger than the Tradewater and had originally a similar or greater promise of success, have not been uniformly encouraging. In general, the benefit has not been sufficient to warrant undertaking new work unless there is a practical certainty of a growth of commerce commensurate with the cost.[47]

Summary

The efforts of the Army Engineers to improve navigation on streams tributary to the Ohio River seldom provided benefits sufficient to reimburse the public investment. Such successes as were experienced on the Green, Kentucky, and Tradewater Rivers were the exception, rather than the rule. Waterborne commerce on tributary streams diminished, in general, in the last quarter of the nineteenth century, and efforts to revitalize the traffic, like those made at the Grand Rapids project on the Wabash and the concrete lock on Rough River, were usually futile. As a result, by the end of the century, the Corps of Engineers was reluctant to approve any waterways project which could not be quickly completed to serve an already extant commerce.

Projects on tributaries would doubtless have been more successful had systematic funding and rapid construction been possible, but this was precluded by congressional policies, by the authorization of too many surveys and too many projects for the funds available to improve. In 1882, for example, Congress made appropriations for eighteen projects on which the Corps had reported *unfavorably*, and for sixteen (including Beattyville project on the Kentucky River) which had not been examined by the Corps at all.[48]

It was somewhat surprising that the Engineers were able to accomplish as much as they did on tributary streams in the face of such meager and haphazard funding

policies. One authority has observed that if the deficiencies of waterways funding policies had been as negligible as those of the Corps of Engineers, rivers and harbors bills would never have been received the appellation "pork barrel."[49] It should also be noted that tributary projects were frequently authorized on the basis of general economic development of a region, rather than actual returns in the form of benefits to navigation computed per ton-mile of commerce; and from this standpoint benefits were often amply realized.

"Pork barrel" policies were revised during the Progressive Era of the early twentieth century. In 1910, for example, President William H. Taft declared: "The proper policy . . . is to determine from the many projects proposed and recommended what are the most important, and then to proceed to complete them with due dispatch; and then to take up others and do the same thing with them."[50] This suggested reform in waterways legislation was adopted; funds were concentrated on completing major through-waterways projects; and tributaries were then improved on the basis of existing demands and needs of traffic, rather than a general developmental basis.